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ABSTRACT

This brief identifies those who are considered scientists and engineers and provides statistical information on their numbers in the workforce by considering their educational backgrounds. The two primary approaches to defining a scientist or engineer are by occupational classification and by science or engineering degree. The data comes from the National Science Foundation's Scientists and Engineers Statistical Data System. (YDS)

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How Large is the U.S. S&E Workforce?

by R. Keith Wilkinson

Estimates of the size of the science and engineering (S&E) workforce can vary significantly depending on how one chooses to classify a scientist or engineer. For example, if only those persons with a bachelor's degree or higher who are employed in an S&E occupation are considered to be part of the S&E workforce, there were approximately 3.5 million scientists and engineers working in the United States in 1999. On the other hand, if any employed individual with a science or engineering degree is counted as part of the S&E workforce, then there were more than 10 million scientists and engineers working in the U.S. in 1999.

So who is a scientist or engineer? There are two primary approaches to defining a scientist or engineer—each of which has its limitations.

Employed in an S&E Occupation: The most common way of counting scientists and engineers in the workforce is to count those with an occupational classification that matches some list of S&E occupations. Occupation comes closest to indicating what work a person is actually doing, although one can question the coding from individual write-ins or employer classifications. An engineer by occupation may have an engineering degree, or not, but if classified correctly will be doing engineering work. One limitation of counting by occupational classification is that it will not capture individuals using S&E knowledge, sometimes extensively, under occupational titles such as manager, salesman, or writer.[1] It is not uncommon for persons in such occupations who hold science or engineering degrees to report that their work is closely related to their degree, and in many cases also report research and development as a major work activity.

Degree in Science or Engineering: Another way to classify scientists and engineers is to count or describe the characteristics of individuals in the workforce who have formal S&E training. Focusing on the field of degree, rather than occupation, may provide a better picture of the training an individual is utilizing in the workforce. For example, it may be more appropriate to classify as a chemist a person with a bachelor's degree in chemistry who is employed as a technical writer for a professional chemists society's magazine.

If any employed individual with a science or engineering degree is counted as part of the S&E workforce, then there were more than 10 million scientists and engineers working in the U.S. in 1999.

Using degrees to classify scientists and engineers may also have its drawbacks. For instance, should a person with a bachelor's degree in biology and a master's degree in engineering be classified as a biologist or as an engineer? Also, should individuals with a bachelor's degree in political science be counted as social scientists if they also have a law degree? One solution to the multiple-degree dilemma is to focus on the field of highest (or most recent) degree, which often best

[1] In some collections of occupation data, the generic classification of postsecondary teacher also masks many university professors who should be included in most concepts of the S&E workforce.

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characterizes the training an individual is utilizing in the workforce. Using highest degree does not solve all problems, however. Many might be comfortable classifying by highest degree in the examples above, but less comfortable excluding from an S&E workforce analysis an individual with a bachelor's degree in engineering who also has a master's degree in business administration.

So how many scientists and engineers are in the workforce?

As discussed above, estimates of the size of the S&E workforce vary depending on the approach one chooses to classify scientists and engineers.

Occupation: If one includes in the S&E workforce only those with a bachelor's degree or higher who are employed in an S&E occupation, there were approximately 3.5 million scientists and engineers in the workforce in 1999 (table 1). Engineers filled 39 percent (1.4 million) of the S&E positions, followe l by computer and mathematical scientists with 33 percent (1.2 million) of the total. Physical scientists accounted for less than 9 percent of those working in S&E occupations in 1999.

About 56 percent of the individuals employed in S&E jobs reported their highest degree was a bachelor's degree, whereas 29 percent listed a master's degree and 14 percent a doctorate. (First professional degrees were reported as the highest degree by about 1 percent.) Almost 46 percent of those with bachelor's degrees as the highest degree were employed as engineers. Another 37 percent of the bachelor's degree group held jobs as computer and mathematical scientists. These occupations were also the most prevalent among those with master's degrees as the highest degree (37 percent and 34 percent, respectively). The most doctorate holders were employed as social scientists or psychologists (26 percent) and life scientists (25 percent).

Of the 3.5 million individuals who reported working in S&E occupations, the vast majority (3.0 million) reported that their highest degree was in an S&E field (table 2). Additionally, there were 255,700 individuals with S&E degrees whose highest degrees were in a non-S&E field. About 8 percent (282,000) of the college-educated individuals working in S&E jobs held no degrees in an S&E field.

Education: If education is used as the criterion for defining scientists and engineers (anyone with a bachelor's or higher S&E degree), there were approximately 10.5 million scientists and engineers in the workforce in 1999 (table 2). A bachelor's degree was the highest degree type for about 57 percent (6.0 million) of these individuals. The remaining 43 percent of S&E degree-holders had earned as their highest degree a master's (2.9 million), doctoral (722 thousand), or other professional degree (899 thousand). About three-fourths (8.0 million) of the 10.5 million scientists and engineers under this classification reported that their S&E degree was also their highest degree, whereas 2.5 million had earned their highest degree in a non-S&E field.

Among those with S&E degrees, individuals whose highest degrees were in S&E were far more likely to

Table 1. **Persons employed in S&E occupations, by occupation and highest degree type: 1999**

S&E occupation	Total[1]	Highest degree		
		Bachelor's	Master's	Doctorate
Total	3,540,800	1,994,400	1,032,100	484,100
Computer and mathematical scientists	1,167,400	740,500	354,100	67,100
Life and related scientists	341,900	135,500	72,500	121,100
Physical and related scientists	297,900	139,600	73,000	84,900
Social and related scientists	166,400	39,300	53,500	68,900
Psychologists	197,000	32,100	102,400	58,000
Engineers	1,370,300	907,400	376,500	84,200

[1]Total includes first professional degrees.

NOTE: Details may not add to total because of rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1999 SESTAT Surveys

be working in an S&E occupation (38 percent) than those whose highest degrees were in non-S&E fields (10 percent) (table 2). The likelihood of those whose highest degree is in science or engineering occupying an S&E job varied by field of degree, however. For example, about two-thirds (67 percent) of S&E degree-holders whose highest degree was in engineering were employed in an S&E job in 1999. About half of those with highest degrees in computer and mathematical sciences and physical sciences (51 percent and 55 percent, respectively) were employed in an S&E occupation in 1999, whereas 11 percent of those with highest degrees in social sciences were employed in an S&E occupation.

The fact that an S&E degree holder is not working in a science or engineering occupation does not mean that he or she is not using his or her S&E training. Of the 62 percent (5.0 million) of S&E degree-holders[2] not working in S&E jobs in 1999, about 67 percent indicated that their jobs were at least somewhat related to their highest S&E degree field (table 3).

Table 2. **Employed S&E degree-holders by S&E/non-S&E employment and field of highest degree: 1999**

Degree field	Total employed	Employed in S&E	Employed in non-S&E
Total with S&E degree	10,479,800	3,258,800	7,221,000
S&E is highest degree	7,980,000	3,003,100	4,976,900
Computer and mathematical sciences	1,045,800	537,200	508,600
Life and related sciences	1,287,700	361,700	926,000
Physical and related sciences	621,700	343,000	278,700
Social and related sciences	1,922,300	220,300	1,702,000
Psychological sciences	1,166,100	237,700	928,400
Engineering	1,936,400	1,303,300	633,100
Non-S&E is highest degree	2,499,800	255,700	2,244,100

NOTE: Details may not add to totals due to rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1999 SESTAT Surveys

Table 3. **Persons with S&E as highest degree employed in non-S&E occupations by occupation and relationship of degree to job: 1999**

Non-S&E occupation	Total	Relationship of job to highest degree			
		Total	Closely related	Somewhat related	Not related
		(Percent)			
Total	4,976,900	100.0	33.2	34.1	32.7
Managers and administrators	1,416,000	100.0	30.0	43.0	27.0
Health and related occupations	322,200	100.0	58.1	27.1	14.7
Pre-collegiate teachers	45? 400	100.0	65.8	22.7	11.5
Non-S&E postsecondary teachers	50,000	100.0	68.1	23.7	8.2
Social services occupations	291,500	100.0	61.2	28.7	10.0
Technologists and technicians	337,600	100.0	46.6	34.1	19.3
Sales and marketing occupations	764,400	100.0	13.3	37.5	49.2
Art and humanities occupations	122,500	100.0	21.7	38.1	40.2
Other non-S&E occupations	1,220,400	100.0	20.0	29.2	50.8

NOTE: Details may not add to totals due to rounding.

SOURCE: National Science Foundation, Division of Science Resources Statistics, 1999 SESTAT Surveys

[2]Refers to highest degree received.

So which classification is most appropriate – occupation or education?

The choice of a workforce definition rests with the user. Both classifications[3] have an appropriate use. If one wishes to count the number of individuals in the workforce engaged in science and engineering activity, then occupation is probably the appropriate classification to use. On the other hand, if one wants to measure the proportion of the workforce trained to perform science or engineering work, then education may be the appropriate definition.

Information in this InfoBrief is from the National Science Foundation's (NSF) Scientists and Engineers Statistical Data System (SESTAT),[4] a unified database recording employment, education, and other characteristics of the nation's scientists and engineers.[5] These data are collected from three component surveys sponsored by the NSF and conducted biennially.

[3]Another or third classification, not discussed here, would be to include in the S&E workforce anyone with an S&E degree *or* S&E occupation. Under this classification, there were approximately 10.8 million scientists and engineers in the workforce in 1999. Included in this total are about 300 thousand individuals who were employed in S&E occupations but who had no S&E degree.

[4]SESTAT is an integration of three surveys: the National Survey of College Graduates (NSCG), the National Survey of Recent College Graduates (NSRCG), and the Survey of Doctorate Recipients (SDR).

SESTAT's target population is residents of the United States with a baccalaureate degree or higher who, as of the study's reference period, were noninstitutionalized, age 75 or less, and either trained as or working as a scientist or engineer (S&E). A baccalaureate or higher degree is a bachelor's, master's, doctoral, or professional degree.

[5]For a detailed discussion of the S&E degree fields and occupations in SESTAT, see National Science Foundation, Division of Science Resources Statistics, *SESTAT: A Tool for Studying Scientists and Engineers in the United States*, NSF 99-337, Authors, Nirmala Kannankutty and R. Keith Wilkinson (Arlington, VA 1999).

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